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ABSTRACT

This paper assesses the extent to which German import competition has contributed to the observed differential decline in manufacturing employment across French regions. The study employs an exposure research design that exploits differences in regional manufacturing specialisation across French *départements* combined with an instrumental variable strategy. The analysis does not establish a connection between German import competition and differential changes in regional French manufacturing employment. This result suggests that German import competition has neither driven nor halted the overall decline of French manufacturing employment. It also indicates that the sizeable and long-lasting negative regional employment effects of trade between China and developed countries do not necessarily generalise.

KEYWORDS

import competition; regional manufacturing employment; France; Germany

JEL F14, F16, L60, R12, R23

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1. INTRODUCTION

Germany's continued and large export surpluses have proven to be a source of international political tension (Jacoby, 2020; Nölke, 2020). One of the complaints lodged against Germany in these debates is that it is not only exporting goods, but also unemployment by absorbing demand and reducing production in destination countries (Opalka et al., 2018; *The Economist*, 2017; Wermuth, 2016). This critique has been particularly virulent in the aftermath of the euro area crisis, where large Eurozone imbalances nearly led to the collapse of the currency union. However, while the academic literature has extensively investigated the connection between German current account surpluses and the euro crisis (e.g., Baldwin et al., 2015; Nölke, 2016; Stockhammer, 2016), there is, as of yet, no empirical study that investigates the impact of German exports on unemployment in the Eurozone.[1] This paper fills this gap by analysing the impact of German import competition on regional French manufacturing employment.

Much of the literature on the euro crisis and euro area convergence and divergence investigates developments between 'core' countries – or simply Germany – and 'periphery' countries, with France uneasily sitting between categories (Gräbner et al., 2020a, 2020b; Nölke, 2016; Stockhammer et al., 2016). By zooming in on Franco-German trade, this study focuses on an economic relationship central to the euro area but which has received less attention in the literature to date.

By taking French regions as the unit of analysis, this paper builds on a growing body of literature that investigates how regional economies respond to international economic integration (for a review, see Redding, 2022). With a primary focus on the consequences of the rise of China for labour markets in industrialised economies, results from these studies have led scholars to appreciate that the potential negative impact of intensified trade can vary substantially across regions and do not necessarily abate quickly (Autor et al., 2016, 2021; Caliendo & Parro, 2023). Differences in economic structures across regions and more sluggish labour supply responses than anticipated in standard trade theory are important drivers of these findings.

The contribution of this paper to the existing literature is thus twofold. First, it adds to the studies analysing the response of regional economies to economic integration

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by considering the local employment effects of increased import competition between industrialised countries. This helps to develop an understanding of whether the at times substantial and long-lasting negative regional employment effects of trade observed between developing and developed countries extend more generally. Second, by analysing Franco-German trade, the study contributes to the body of work on euro area dynamics. To date, this literature focuses on economic processes between Germany and the periphery. Given the central role of the Franco-German partnership for the euro area and the European Union more generally, a better understanding of its economic implications is crucial.

To identify the effects of German import competition on French regional manufacturing employment, this study closely follows the empirical strategy in Autor et al. (2013). Regional differences in manufacturing specialisations across French regions are leveraged to implement an exposure research design and combined with an instrumental variable (IV) strategy. As in Autor et al. (2013) and the studies building on the work, the instrument used here is of the Bartik type (also known as shift–share instruments). As detailed in two recent contributions, achieving identification in this set-up rests on assuming exogeneity of either the shares (Goldsmith-Pinkham et al., 2020) or of the shifts (Borusyak et al., 2022). While Autor et al. (2013) follow the latter approach, this study assumes exogeneity of the shares, since the two relevant conditions for consistency under shift exogeneity – that there are many such shifts and that these are quasi-randomly assigned – do not hold in this setting.[2]

The analysis does not establish a connection between German import competition and the differential decline in manufacturing employment observed across French regions. A strong, negative relationship indicated by a simple bivariate regression is not maintained once other factors are controlled for. This finding also holds when considering alternative measures of import competition and when extending the analysis to include French trade with other Eurozone countries. While the focus of the study is on the regional level, this result suggests that the deepened economic integration amongst Western European countries – at least along the trade dimension – has not contributed to the overall aggregate decline of manufacturing employment in France; but nor has it halted it given the lack of a positive association. The results furthermore indicate heterogeneous effects of import competition across industries. Due to data limitations, these patterns of heterogeneity cannot be probed further, though future research might find this an interesting avenue to pursue.

The remainder of this article is structured as follows. The subsequent section reviews the recent literature on the regional effects of economic integration and motivates this study's research question. Section 3 discusses the empirical approach. Section 4 overviews the data sources and variable construction. Section 5 presents the results. Section 6 concludes.

2. REGIONAL RESPONSES TO ECONOMIC INTEGRATION

Over the last decade, the trade literature has produced a substantial body of research highlighting the significant role of geography in distributing the gains and losses of trade (see Redding, 2022, for an encompassing review). While earlier work such as by Borjas and Ramey (1995) or Topalova (2010) already discussed this channel, it was the seminal article by Autor et al. (2013) that ignited the recent flurry of studies investigating the heterogeneous effects of trade across regions. The latter exploits China's integration into the world economy to study the effect this had on local US labour markets. Using an exposure research design, the authors show how regions more strongly exposed to the China shock see larger declines in their share of manufacturing employment. Their main estimation results (Autor et al., 2013, tab 3, col. 6) imply that a local labour market at the 75th percentile of exposure to the import shock experienced a 0.63 percentage point larger decline in its share of manufacturing employment than a local labour market at the 25th percentile between 2000 and 2007. But the negative impacts of import competition were not confined to the manufacturing sector. Regions more exposed to the China shock saw higher pick-ups in unemployment, disability and income assistance benefits and a fall in earnings and in the employment to population ratio, too. These regions also witnessed higher rates of children raised in poverty and an increase in mortality due to drug and alcohol abuse (Autor et al., 2019; Pierce & Schott, 2020).

A host of studies follow Autor et al. (2013) to investigate how China's rise has affected local economies across industrialised nations (e.g., Dauth et al., 2014, for Germany; Balsvik et al., 2015, for Norway; Donoso et al., 2015, for Spain; Foliano & Riley, 2017, for the UK; Malgouyres, 2017, for France; and Citino & Linarello, 2022, for Italy; Caliendo & Parro, 2023, provide an extensive review of the China shock literature; Dorn & Levell, 2021, compare and contrast the US and European experiences to the China shock). While the effect sizes differ, these studies all highlight a negative relationship between increased import competition from China and local manufacturing employment.[3]

A major focus on the China shock notwithstanding, the regional responses to international economic integration have also been studied in other settings. Chiquiar (2008), Topalova (2010) and Kovak (2013), for example, uncover the consequences of trade liberalisation for wages and poverty in regions of Mexico, India and Brazil, respectively. These studies likewise highlight how regional variation in the exposure to a trade shock drives how local economies react to that shock.[4]

A comprehensive conceptual framework to think about how import competition links to regional labour markets is provided by Acemoglu et al. (2016). They highlight that from an industry perspective, the effects will depend on where in the supply chain the increased competition takes place. Firms in direct competition with importers might see their output and employment decline as a result, as might domestic firms that supply to those firms. Domestic firms sourcing from those firms, however, might see output and employment rise, since increased competition might entail cheaper prices for them. Next to these industry-specific effects, the authors also emphasise reallocation and aggregate demand effects. Reallocation effects capture the absorption of labour and other factors of production into other industries and thus work to offset the potential negative consequences of increased import competition. Aggregate demand effects, on the other hand, amplify their impact through local multipliers. Comparing results from national industry-level regressions of the China shock with estimates from a regional labour market analysis, the authors show that the effects of import competition are not limited to directly exposed industries but that they are transmitted to the wider regional economy through local aggregate demand effects.

Further theoretical insights into how import competition can impact on local labour market outcomes can be found in Autor et al. (2013) and Kovak (2013). The former motivate their regression specification with a gravity model, where the employment responses of regional labour markets to trade shocks depend on the degree of concentration of industries across regions. The latter develops a specific factor model in which national industry price changes affect local economies differently depending on the relevance of an industry for a region. The thinking the two approaches share is intuitive: regions will respond differently to economic integration depending on their initial economic structures. This adjustment aspect has been underappreciated in, for example, Heckscher–Ohlin type trade models, where factor mobility ensures that costs are spread across all industries and regions of an economy (Autor et al., 2021; Dorn & Levell, 2021).

Recent work has furthermore highlighted that the effects of increased trade integration on exposed regions can be long-lasting. Studying the trade liberalisation of Brazil, Dix-Carneiro and Kovak (2017) report that the effects of liberalisation on regional earnings is three times larger 20 years after liberalisation compared with after 10 years. In a follow-up study to their 2013 paper, Autor et al. (2021) similarly document a persistent negative effect of import competition on US local labour markets nine years after the plateauing of the China shock.

Results from studies employing quantitative spatial models further corroborate the importance of considering geography as a crucial dimension in assessing the costs and benefits arising from greater economic integration. Findings in, for example, Caliendo et al. (2019), Galle et al. (2023) and Rodríguez-Clare et al. (2022) suggest that while the United States has overall experienced small welfare gains from increased trade with China, this gain masks considerable geographical heterogeneity, with some regions seeing their welfare decline.

Given the evolution of the literature, the discussion has to this point mostly drawn on literature related to increased competition from China; and while the rise of China has evidently been a defining feature of the era of 'hyperglobalisation' (Subramanian & Kessler, 2013) that started in the 1990s, Europe has also undergone further integration processes during this period. Not only did this period mark the start of the integration of Eastern European countries into the Western economic system, but Western EU countries themselves also deepened their economic integration with the launch of the single market and the introduction of the euro both falling into this decade.

Following these integration steps, inner EU trade did indeed develop strongly, at least up until the global financial crisis (Stehrer et al., 2016). In particular within the newly formed currency union, however, the intensified trade relations evolved markedly unbalanced. The resulting sizeable current account imbalances were at the centre of the Eurozone crisis that erupted in 2010 (Nölke, 2016; Stockhammer, 2016).

As the euro area's leading surplus nation, Germany has come under repeated criticism for its large export surpluses. One of the charges levied against Germany in these public debates is that its surpluses are creating unemployment in partner countries through absorbing demand and crowding out domestic production (Opalka et al., 2018; *The Economist*, 2017; Wermuth, 2016). Studies analysing the evolution of EU value chains do indeed suggest that the intensified trade between member states has also been accompanied by industrial restructuring on the continent, with Germany and its Eastern neighbours growing their share of manufacturing activity at the cost of other countries (Ederer & Reschenhofer, 2018; Stöllinger, 2016; Stöllinger et al., 2018).

From the perspective of traditional trade theory, however, these claims do not necessarily follow. Rather, theory would judge liberalisation between similarly developed countries to be beneficial for all factors of production, as long as comparative advantage is not too pronounced and economies of scale are sufficiently strong (Krugman, 1981, 2009). The benefits of a larger market will then outweigh negative effects resulting from intensified trade. Furthermore, this theory ascribes no specific role to trade imbalances in affecting employment levels (Krugman, 2019).

But, if the preceding discussion has highlighted anything, then that such long-run equilibrium outcomes potentially mask considerable and persistent regional adjustment costs. The view on trade imbalances has likewise started to change, with scholars now appreciating that they can influence how well labour markets adjust to increased economic integration (Dix-Carneiro et al., 2023; Krugman, 2019).[5] It is for these reasons that this study investigates the effects of German import competition on regional French manufacturing employment.

The focus here is on France because of the importance of its relationship with Germany for the euro area and the wider EU. To date, their economic relationship has, however, received less attention in the literature on the Eurozone crisis and euro area convergence, since much of this literature analyses developments between 'core' countries – or simply Germany – and 'periphery' countries, with

France uneasily sitting between categories (Gräbner et al., 2020a, 2020b; Nölke, 2016; Stockhammer et al., 2016).

France furthermore makes for an attractive case study because Germany is, by some margin, France's most important trading partner and this relationship has become noticeably one-sided over the past two decades. As panel A in Figure 1 shows, between 1995 and 2019, France imported just under 19% of its goods from Germany. The relative stability of the share of imports from Germany over this 24-year period – fluctuating between 17.6% and 20.4% – is noteworthy, given the shifts in global trade during this period due to the fall of the Iron Curtain and the rise of China.[6] Panel B in Figure 1 captures the deterioration of France's trade balance vis-à-vis Germany. After fluctuating between €–5 billion and €–15 billion for most of the 1960s to the 1990s, it started declining sharply around the turn of the millennium, reaching a minimum of €–43 billion in 2012. The changing trading relationship is also reflected in the considerable worsening of France's revealed comparative advantage (RCA) in manufacturing vis-à-vis Germany during the first decade of the euro. As displayed in Figure A1 in Appendix A in the supplemental data online, the difference between the two countries' RCA grew by about 8.5 percentage points between 2001 to 2010.[7]

In light of the preceding discussion, this article therefore contributes to the existing literature in two ways. First, it adds to the recent studies analysing the regional

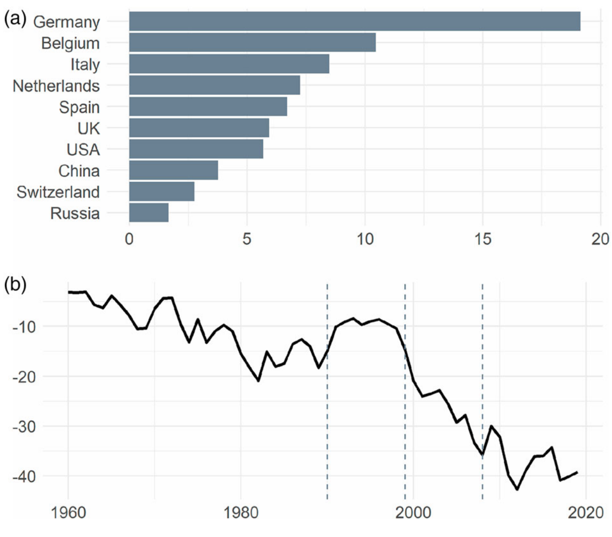

Figure 1. (a) French import shares, 1995–2019 (%); and (b) trade balance between France and Germany, 1961–2019 (billions of 2015 euros).
Note: Panel (a) displays the 10 most important French trading partners, measured by their respective share in French imports between 1995 and 2019. Panel (b) shows the evolution of the Franco-German trade balance (of goods) from 1961 to 2019, measured in billions of 2015 euros. The dashed grey lines in (b) indicate German reunification in 1990, euro introduction in 1999 and the 2008 financial crisis, respectively. The data for (b) are available upon request from the German statistics authority Destatis.

employment effects of increased economic integration. By analysing the effects of import competition between two industrialised countries it helps to further our understanding of how regional economies adjust to increased economic integration. Second, through its focus on the Franco-German relationship, it expands the literature on euro area dynamics. Given the centrality of this relationship for the euro area and the wider EU, a better understanding of its economic implications is essential.

Having reviewed the related literature and motivated the research question, the following section introduces the estimation approach and identification strategy used in this paper.

3. EMPIRICAL APPROACH

Following Autor et al. (2013), this study employs an exposure research design leveraging differences in regional industry specialisation between French regions combined with an instrumental variable (IV) strategy to gauge the impact of German import competition on regional French manufacturing employment.

To investigate the relationship between German import competition and regional manufacturing employment, the following structural model is used:

$$\Delta E_{it}^{m} = \gamma_t + \pi_1 \Delta IC_{it} + X_{it}^{'} \pi_2 + u_{it} \tag{1}$$

where E_{it}^{m} stands for a region's six-year change in its share of manufacturing employment (measured in percentage points), γ_t includes period dummies and time trends for the 13 higher level regions of France, $X_{it}^{'}$ is a vector of start-of-period regional controls, ΔIC_{it} is the change in German import competition faced by a region over a six-year period, and u_{it} is an idiosyncratic error term. The model thus links changes in a region's share of manufacturing employment to the changes of German import competition a region experienced over that period.

The choice of constructing six-year (overlapping) periods was made based on data availability and on considerations of the asymptotic properties of the IV estimator. Given 96 cross-sectional observations and 24 years of data, choosing six-year periods results in 384 observations. Malgouyres (2017) likewise uses six-year periods, while Donoso et al. (2015) construct five-year periods, as do Balsvik et al. (2015) (though theirs are non-overlapping).

The main regressor of interest is ΔIC_{it}, the period change in German import competition. Drawing on Autor et al. (2013), ΔIC_{it} is defined as:

$$\Delta IC_{it} = \sum_{j} \frac{E_{ijt}}{E_{jt}} \frac{\Delta M_{jt}}{E_{it}} \tag{2}$$

with E_{ijt}/E_{jt} giving region i's share of national employment in industry j, and $\Delta M_{jt}/E_{it}$ giving the change in German exports to France in industry j, normalised by region i's overall employment. Imports are measured in thousands of 2015 euros, meaning a 1 unit change in ΔIC_{it} represents a €1000 change in real imports per worker.

Variation in ΔIC_{it} is driven by two factors: differences in manufacturing and non-manufacturing employment across regions (the first term of the sum) and the degree to which a region hosts industries exposed to imports from Germany. Variation in manufacturing employment is not the main driver, though, explaining only about a third of variation in the import competition variable.[8]

Exploiting these differences in interregional manufacturing specialisations in constructing the import competition variable is the first step in the empirical approach and the basis of this study's exposure design. An obstacle remaining for the identification of the coefficient of interest π_1 is the endogeneity of the exposure variable. The chief concern here is that contemporaneous regional employment is determined anticipating future German import competition, thereby inducing simultaneity bias. In order to guard against this form of endogeneity, ΔIC_{it} is therefore instrumented for with:

$$\Delta IC_{it}^{\text{fixed}} = \sum_j \frac{E_{i,j,89}}{E_{j,89}} \frac{\Delta M_{jt}}{E_{it}} \tag{3}$$

where industry employment shares are fixed at their respective 1989 levels.[9]

This instrument has a Bartik structure. These instruments are typically constructed as a weighted sum of common shocks, with weights measuring the differential exposure to these shocks. For some individual location i, the instrument can thus be written as:

$$B_i = \sum_j w_{ij} s_j$$

where w_{ij} measures location i's exposure, and s_j are the common shocks. In this study (as in Autor et al., 2013), the weights are local manufacturing industries employment shares and the shocks the level growth in manufacturing imports per worker from Germany. As shown by Goldsmith-Pinkham et al. (2020), assuming exogeneity of the weights is a sufficient condition for the validity of such Bartik-type instruments and thus for identification. No assumptions are needed about the statistical properties of the shocks. Assuming weight exogeneity in this study implies that the 1989 fixed industry shares do not affect changes in the share of manufacturing employment directly but only through the differential exposure to German import competition.

The IV used here differs from that used by Autor et al. (2013), who use not only (updated) lagged industry employment shares but also instrument for Chinese imports to the United States with Chinese imports to a group of other high-income countries. They do so to purge observed US imports from China from US demand shocks that might be correlated with both Chinese imports and regional manufacturing employment. As elaborated by Autor et al. (2021), the identifying assumption underpinning this IV strategy is that Chinese imports to other high-income countries are exogenous shocks that only influence regional US manufacturing employment through predicting Chinese imports to the United States. Autor et al. (2013) thus build their identification strategy not on the exogeneity of the weights but of the shocks. Borusyak et al. (2022) demonstrate the consistency of Bartik instruments in such settings.[10]

This study approaches identification differently to Autor et al. (2013) since consistency of the Bartik instrument under shock exogeneity rests on there being many shocks and that these shocks are (conditionally) quasi-random (Borusyak et al., 2022, sect. 3). Neither condition is likely to hold in the given setting. First, the employment data follow the French industry classification NAF A38, which only distinguishes between 13 manufacturing industries, substantially fewer than the 397 industries in Autor et al. (2013). Second, conceptualising German imports to France – or to other high-income countries – as quasi-random shocks seems difficult. In statistical terms, this would require $E[\Delta M_j | \bar{e}_j, w_j] = \mu$ for all j, where μ is a constant, $\bar{e}_j$ are industry-level unobservables (defined as exposure weighted averages of the errors from the structural equation), and w_j are industry weights (this exposition follows Borusyak et al., 2022, p. 190). That is, changes in German imports to France are not correlated with trends in French regional manufacturing employment. This assumption might be hard to meet, even when using German imports to other high-income countries, given the interconnectedness of the French, German and other high-income economies and the high-level industry aggregates used in this analysis. French firms integrated into German supply chains, for example, would be affected by Germany expanding its imports to other economies such as Japan, Sweden or Australia.

Before presenting the results of the empirical analysis, the subsequent section briefly discusses data sources and variable construction.

4. DATA SOURCES AND VARIABLE CONSTRUCTION

Having outlined the empirical approach, this section provides an overview of data sources and variable construction. Appendix A in the supplemental data online provides descriptive statistics. A list of data sources is provided in Appendix B online.

The import and export data used in the analysis are taken from Eurostat's Comext database, which provides annual trade data at the four-digit product level, following the EU's classification of products by activity (CPA) 2008 nomenclature.[11] To deflate the trade data, the import and export deflators from the annual macroeconomic database of the European Commission's Directorate General for Economic and Financial Affairs (AMECO) are used, with 2015 as the base year. Table A1 in Appendix A in the supplemental data online displays the three most important import and export categories between France and Germany for 1995, 2007 and 2019. It shows that while trade volumes have increased considerably (especially between 1995 and 2007), the top two export and import categories between the two countries – the manufacture of motor vehicles and the manufacture of air and spacecraft – have remained unchanged over this 24-year period. This suggests strong cross-national industry ties within these categories.

The regional units of analysis of this study are the 96 *départements* (DEPs) of mainland France, which include the Mediterranean island Corsica, but exclude French overseas territories. Population and employment data for these are provided by the French statistic's authority (Institut National de la Statistique et des Études Économiques – INSEE). The employment data follows the French industry classification NAF A38, which distinguishes between 13 manufacturing industries. Table A2 in Appendix A in the supplemental data online lists these industries and how they correspond to the EU's NACE rev. 2, and hence also the CPA 2008, nomenclature. While this classification is less granular compared with those used in other studies, such as Autor et al. (2013) and Dauth et al. (2014), it still allows for sufficient variation in the import competition variable, as mentioned above.

Combining the trade and employment data allows for the construction of the import competition variable ΔIC_{it}. As this paper focuses on six-year changes in the share of manufacturing employment, ΔIC_{it} measures the level change of import competition in region i over a six-year period. With regional sectoral employment data available from 1989 onwards, four six-year periods are constructed, running from 1995 to 2019, and the 1989 employment data is used to construct the IV, as discussed above. As can be seen from Table A3 in Appendix A in the supplemental data online, changes in German import competition were largest during the first half of the sample, that is, before the onset of the global financial crisis and the Eurozone crisis.

The dependent variable is the change in a DEP's share of manufacturing employment. It is calculated as the ratio between the number of people employed in manufacturing industries over the working age population (defined here as the population between 15 and 65 years of age). For mainland France, this share declined by 3.02 percentage points from 9.86% in 1995 to 6.84% in 2019. This aggregate figure, however, masks considerable heterogeneity between regions. The *département* Hauts-de-Seine, for example, saw its share decline by 8.1 percentage points, while Lozère saw its share increase by 2.64 percentage points. The interquartile range of the change in the share of manufacturing employment runs from −3.74 to −0.99 percentage points. This regional heterogeneity is highlighted further in Figure 2, which displays the changes in manufacturing employment across French *départements*.[12]

To account for differences between DEPs other than their exposure to German imports that might be related to the outcome variable, the analysis includes several controls. To this end, the log of regional gross domestic product (GDP), measured in 2015 euros and taken from the annual regional database of the European Commission's Directorate General for Regional and Urban Policy (ARDECO), controls for differences in economic developments between regions. Differences in labour force composition between DEPs are accounted for by the

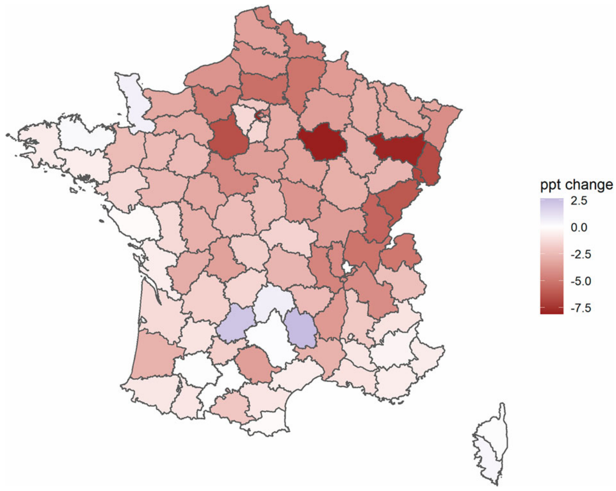

Figure 2. Percentage point change in the share of manufacturing employment across French *départements*, 1995–2019.

rate of employment amongst females (calculated as the ratio between the total number of females employed over the female working-age population), the share of the population holding a university degree and the share of foreign born amongst the population. Finally, the shares of the population between 0–17, 18–39 and 40–64 years are also included to control for demographic differences between DEPs. The age, education and nationality data are taken from the French census and are linearly interpolated for missing years.

5. GERMAN IMPORT COMPETITION AND REGIONAL MANUFACTURING EMPLOYMENT IN FRANCE

This section presents the results of the econometric analysis. Equation (1) is estimated instrumenting for 2 with 3. As discussed above, the key assumption for identification is that the fixed 1989 industry shares are uncorrelated with the changes in the regional shares of manufacturing employment and predict these changes only through the differential exposure to German import competition. Observing the 96 DEPs over four six-year periods (from 1995 to 2019), gives a balanced panel of $n = 96$ and $T = 4$, and hence 384 observations. The results of the benchmark model are discussed first before robustness checks and extensions to the model are considered.

5.1. Benchmark specification

Figure 3 plots the results of estimating the most parsimonious specification of the model (see also column 1 in Table 1). This regression includes only time fixed effects, with no further controls, and standard errors clustered at the level of the 13 French regions to account for potential spatial spillovers.[13] Panel A displays first-stage results, with the reduced form plotted in panel B. The point estimate from this specification suggests that a 1 unit increase in import competition (that is an increase of €1000 2015

Figure 3. Effect of import competition on the share of manufacturing employment, two-stage least squares (2SLS) estimation: (a) 2SLS first-stage coefficient = 1; SD = 0.02; $t = 49.14$; (b) ordinary least squares (OLS) reduced-form coefficient = −0.65; SD = 0.11; $t = -5.92$.
Note: Displayed are first-stage and reduced-form results from estimating equation (1), only including time fixed effects and no further controls. Standard errors are clustered at the level of French regions. $N = 384$.

euros per worker) entails a 0.649 percentage point decrease in the share of regional manufacturing employment.

This result, however, starts to dissipate as soon as control variables are added. Indeed, when adding a DEP's start of period share in manufacturing employment as a control, the point estimate increases to −0.139, and the confidence interval becomes very wide. This result suggests that the point estimate from the bivariate regression does not so much capture the effects of German import competition but rather an overall trend decline in manufacturing employment across French DEPs. The estimate for the start of period share of manufacturing employment (Table 1, column 2) implies that a DEP with a one percentage point higher share of manufacturing employment will experience a relatively stronger decline in its share of manufacturing employment of 0.1 percentage point.

Adding further controls pushes the point estimate of the import competition variable ever closer to zero. Results are summarised in Table 1, with the last column presenting results of a pooled regression without IV for comparison. The preferred specification is given in column 4. It allows for region specific time trends and results in a point estimate of 0.046 and a relatively large standard error. The analysis therefore does not allow the rejection of the null hypothesis of no effect of German import competition on French regional manufacturing employment. First-stage results (provided at the bottom of Table 1) are encouraging for all four specifications, with *F*-statistics indicating very strong instruments.[14] Robustness tests are conducted next, before extensions to the model along three lines are considered.

5.2. Robustness checks

The subsequent robustness checks closely follow the guidelines provided in Goldsmith-Pinkham et al. (2020). To begin with, recall that the Bartik instrument is constructed as a weighted average, with manufacturing industries shares acting as weights in this analysis. Goldsmith-Pinkham et al. show that using the Bartik instrument is equivalent to using these weights as instruments and that the Bartik estimator $\hat{\pi}_B$, that is, the two-stage least squares (2SLS) estimator using the Bartik instrument, therefore combines many instruments. Following Goldsmith-Pinkham et al., this allows $\hat{\pi}_B$ to be decomposed into:

$$\hat{\pi}_B = \sum_j \hat{\alpha}_j \hat{\pi}_j$$

with:

$$\sum_j \hat{\alpha}_j = 1$$

Table 1. Effects of German import competition on regional French manufacturing employment, 1995–2019.

Dependent variable: 6-year change in the share of manufacturing employment (percentage points)					
	(1)	**(2)**	**(3)**	**(4)**	**POLS**
Import Comp per Worker	−0.649***	−0.139	0.044	0.046	0.138
	(0.105)	(0.141)	(0.093)	(0.069)	(0.125)
Share Empl in Manufacturing		−0.099***	−0.120***	−0.119***	−0.125***
		(0.023)	(0.016)	(0.028)	(0.023)
Share Empl amongst Women			−0.011*	−0.009	−0.009
			(0.006)	(0.007)	(0.008)
Share Pop under 18			0.005	−0.011	−0.012
			(0.027)	(0.042)	(0.037)
Share Pop betw 18 & 39			−0.084***	−0.023	−0.026
			(0.024)	(0.034)	(0.037)
Share Pop betw 40 & 64			−0.073	0.017	0.011
			(0.052)	(0.047)	(0.058)
Share Pop with Uni Degree			0.051***	0.019	0.018
			(0.013)	(0.016)	(0.022)
Share Foreign Born			−0.046***	−0.040***	−0.041***
			(0.010)	(0.012)	(0.011)
Log Reg GDP			0.012	0.004	0.007
			(0.034)	(0.028)	(0.036)
Time fixed effects	Yes	Yes	Yes	Yes	Yes
Region × Time fixed effects				Yes	
	Two-stage least squares (2SLS) first-stage results				
IC Fixed Ind Shares	0.995***	0.942***	0.956***	0.967***	n.a.
	[49.136]	[26.766]	[34.788]	[39.437]	n.a.
Observations	384	384	384	384	384

Note: Standard errors shown in parentheses are clustered at the level of French regions, t-statistics are given in brackets. First-stage regressions include the same set of controls as their corresponding second stages. n.a., Not applicable; POLS, pooled ordinary least squares (OLS). ***, ** and *Significant at the 1%, 5% and 10% levels, respectively.

The $\hat{\alpha}_j$, called Rotemberg weights in Goldsmith-Pinkham et al. reflect the importance of specific industries in the overall Bartik estimator. They thus show which particular industries are most important for the overall estimator and serve as guides in detecting potential misspecification. Negative $\hat{\alpha}_j$ are possible and in combination with starkly varying $\hat{\pi}_j$ can result in the overall Bartik estimator to no longer have a local average treatment effect (LATE)-like interpretation.[15]

Table 2, drawing on the exposition in Goldsmith-Pinkham et al. (2020), summarises key statistics of the $\hat{\alpha}_j$ and lists the three industries with the largest weights (out of a total of 13). Panel C shows that the 'Cars and Transport Equipment'[16] industry dominates the estimator, receiving 72% of the absolute weight (0.773/1.068). Adding the second and third highest industries takes this up to 88%. This result highlights that one should be especially concerned with violations of the identifying assumption relating to these industries and the transport industry in particular. The high weight assigned to the latter category chimes with intuition. As discussed above, French imports from Germany falling under this grouping have consistently been the most important import category for the 1995–2019 period. Panel B gives an indication as to why this is: the correlation between the alphas and the shocks is almost 1.[17]

One straightforward way to test the plausibility of the identifying assumption would be to test for parallel pre-trends in the three high-weight industries. Unfortunately, a lack of data for the pre-1989 period prohibits such a test. Table 3 instead investigates the relationship between the 1989 fixed industry shares and the control variables. It reports separate cross-sectional regressions of 1989 industry shares on 1995 characteristics. This exercise can help in revealing patterns that potentially affect the trends of manufacturing employment across DEPs. The one pattern that stands out from Table 3 is that all three shares are positively associated with locations with a higher share of a university educated population, though this association is too weak for the 'Machinery & Equipment' share to be statistically significant. This pattern potentially indicates that trends in manufacturing employment in DEPs with

Table 2. Summary of α-weights.

Panel A: Negative and positive weights

	Sum	Mean	Share
Negative	−0.034	−0.008	0.032
Positive	1.034	0.115	0.968

Panel B: Correlations of industry aggregates

	$\hat{\alpha}_j$	s_j	$\hat{\pi}_j$	$Var(w_j)$
$\hat{\alpha}_j$	1			
s_j	0.970	1		
$\hat{\pi}_j$	0.212	0.144	1	
$Var(w_j)$	0.059	0.029	−0.102	1

Panel C: Top three Rotemberg weight industries

	$\hat{\alpha}_j$	s_j	$\hat{\pi}_j$
Cars Transport Equipment	0.773	11,159,441	0.203
Machinery	0.098	1,962,062	−0.411
Computers Electronics	0.069	2,257,535.25	0.210

Panel D: Estimates of $\hat{\pi}_j$ for positive and negative weights

	α-weighted Sum	Mean
Negative	−0.002	−0.244
Positive	0.048	−1.327

Note: Reported are summary statistics of the α-weights. Reported statistics for industry j are aggregated across years (Goldsmith-Pinkham et al., 2020, p. 2602). Panel A displays the mean, share and sum of the positive and negative weights. Panel B reports correlations between $\hat{\alpha}_j$, industry shocks s_j, individual industry coefficients $\hat{\pi}_j$ and variation in industry shares across DEPs $Var(w_j)$. Panel C lists the three industries with the largest α-weights. Panel D presents summary statistics for the $\hat{\pi}_j$ by positive and negative weights.

Table 3. Correlation between 1989 industry shares and control variables.

	Cars transport equipment	Machinery equipment	Computers electronics
Share Empl in Manufacturing	0.096	0.103**	0.202*
	−0.070	−0.045	−0.105
Share Empl amongst Women	−0.022	−0.023	−0.141*
	−0.028	−0.024	−0.075
Share Pop under 18	0.054	0.024	−0.081
	−0.049	−0.072	−0.095
Share Pop betw 18 & 39	−0.038	0.080	−0.211*
	−0.126	−0.071	−0.109
Share Pop betw 40 & 64	−0.208	−0.204	−0.613*
	−0.276	−0.219	−0.288
Share Pop with Uni Degree	0.386**	0.081	0.799***
	−0.145	−0.075	−0.213
Share of Foreign Born	−0.030	0.046*	0.004
	−0.028	−0.022	−0.034
Log of Reg GDP	0.152	0.090	0.052
	−0.116	−0.076	−0.126
R^2	0.56	0.53	0.66
Observations	96	96	96

Note: Each column represents a separate regression of the respective 1989 industry shares on 1995 characteristics. Standard errors, clustered at the level of French regions, are given in parentheses. ***, ** and *Significant at the 1%, 5% and 10% levels, respectively.

a higher concentration of an educated population might be affected by other factors. While controlling for education levels clearly helps to mitigate this potential bias, this should not be taken lightly. Some comfort is taken, though, with the association being the same, that is positive, for all three shares, as this could mean that these factors are the same or similar across DEPs with a higher share of university graduates and are thus accounted for by the time trends in the analysis. It would be more worrisome, for example, if the transport share were to show a negative association and the 'Computers & Electronics' share a positive one. It is also reassuring that there are no further significant relationships between the transport category and the other covariates, given the high α-weight assigned to it.

For a final robustness check, one can exploit the fact that the Bartik estimator combines many instruments. This means that the baseline specification can be re-estimated with overidentified 2SLS and limited information maximum likelihood (LIML). Results are reported in Table 4. The first column displays coefficient estimates using the Bartik 2SLS, overidentified 2SLS and LIML estimators. The similar point estimates of these estimators are a good sign.[18] The rejection of the overidentification tests reported in the second column, however, points to misspecification under the assumption of constant effects. But this assumption does not seem to be plausible in the current setting. As can be seen from panel C of Table 2, the $\hat{\pi}_j$ for the two most important industries are very different. Figure 4 further highlights this pattern of heterogeneity. It shows considerable dispersion of the individual estimates around the overall Bartik estimate (the dashed horizontal line).

As noted above, a large dispersion in the $\hat{\pi}_j$ in combination with negative $\hat{\alpha}_j$ can lead to the Bartik estimator losing its LATE-like interpretation. The results, however, indicate that this is probably not the case here. While panel D in Table 2 shows that the mean of the $\hat{\pi}_j$ is indeed quite different for positive and negative α-weights, the α-weighted sum of the $\hat{\pi}_j$ with negative weights is very small implying that they are of minor quantitative importance for the overall estimate. Figure 4 also supports this interpretation, showing that there is only one $\hat{\pi}_j$ with a negative α-weight with a first-stage F-statistic greater than 5.[19]

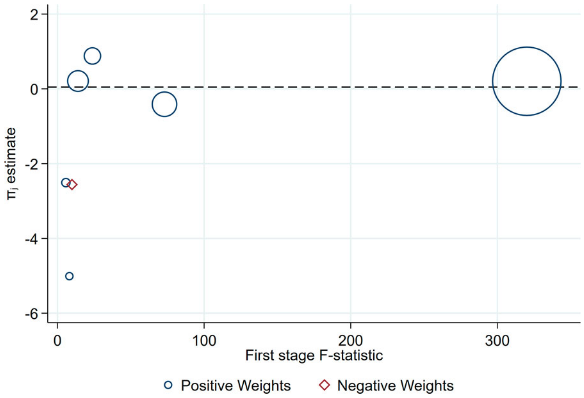

Figure 4. α-weighted estimates of π_j.
Note: Plotted are the estimates of the individual π_j, weighted by their α values, against their respective first-stage F-statistics. Only estimates with a first-stage F-statistic greater 5 are plotted. The dashed horizontal line marks the value of the overall Bartik two-stage least squares (2SLS) estimate from Table 1, column 4.

Table 4. Other estimators and overidentification tests.

	Change Empl Manu	Over ID
2SLS Bartik	0.046	
	(0.069)	
2SLS Over ID	0.070	26.446
	(0.125)	[0.009]
LIML	0.063	28.660
	(0.127)	[0.003]
Time × region dummies	Yes	
Observations	384	

Note: Reported are the results of estimating equation (1) with different estimators. The first row reproduces the result from Table 1, column 4. Row 2, 2SLSL Over ID, uses each industry share separately as instruments. Row 3, LIML, uses the limited information maximum likelihood estimator with the same set of instruments. Overidentification tests and corresponding p-values are reported in column 3. For 2SLS Over ID, Sargan's (1958) χ^2-test is reported, and for LIML, the Anderson and Rubin (1950) χ^2-test. Standard errors are shown in parentheses; p-values are given in brackets.

5.3. Extensions

Having discussed the robustness of the benchmark result, extensions to the baseline analysis are considered next. More broadly, this study asks to what extent trade (with another industrialised nation) has impacted on regional manufacturing employment in France. So far, however, only imports from one country have been taken into account. Thus, to explore this question further, the effects of net-imports, third-market import competition, and import competition from other euro countries and the UK are examined below.

Net-import competition is defined as:

$$\Delta IC_{it}^{\text{net}} = \sum_j \frac{E_{ijt}}{E_{jt}} \frac{\Delta M_{jt} - \Delta X_{jt}}{E_{it}} \quad (4)$$

where the ΔX_{jt} denote period changes in French exports to Germany in industry j. Using net imports helps to focus attention on the effects of import competition while accounting for exports and is also a crude way of taking supply chains between France and Germany into account. The instrument for this measure is constructed as before, by fixing local manufacturing industry shares in 1989.

Apart from on their domestic market, French firms face competition from German firms also abroad. Borrowing from Dauth et al. (2014), global import competition is therefore defined as:

$$\Delta IC_{it}^{\text{global}} = \sum_j \frac{E_{ijt}}{E_{jt}} \frac{\Delta M_{jt} + \sum_l \frac{X_{jt}^l}{X_{jt}^{\text{world}}} \Delta X_{jt}^{lD}}{E_{it}} \quad (5)$$

where $X_{jt}^l / X_{jt}^{\text{world}}$ measures French exports to country l in category j as a share of total French exports in this

Table 5. Net and global import competition and import competition from other euro countries and the UK.

Dependent variable: 6-year change in the share of manufacturing employment (percentage points)								
DE	**Net**	**Global**	**Core**	**Core + DE**	**Periphery**	**EA**	**EA + UK**	**EA + DE**
0.046	−0.055	−0.036	−0.060	−0.004	0.052	0	0.026	0.006
(0.069)	(0.129)	(0.024)	(0.102)	(0.049)	(0.093)	(0.054)	(0.042)	(0.034)
2SLS first-stage results								
0.97***	0.87***	0.82***	0.97***	0.95***	0.90***	0.93***	0.94***	0.94***
[39.44]	[18.88]	[15.63]	[14.78]	[30.06]	[28.98]	[22.30]	[20.50]	[35.09]

Note: N = 384. Standard errors, shown in parentheses, are clustered at the level of French regions; t-statistics are given in brackets. Reduced-form and first-stage regressions include the same set of controls as the specification in Table 1, column 4. DE = import competition from Germany; Net = net-import competition as defined in equation (4); Global = global import competition as defined in equation (5); Core = import competition from Austria, Belgium, Finland and the Netherlands; Periphery = import competition from Greece, Ireland, Italy, Spain and Portugal; EA = import competition from core + periphery; ***, ** and *Significant at the 1%, 5% and 10% levels, respectively.

category at the beginning of period t; and ΔX_{jt}^{lD} is the level change of German exports to country l in category j. German exports are thus weighted by how important an export market the destination country is for France. The third countries used here are the 15 most important export markets for France between 1990 and 2019.[20] Using industry shares fixed in 1989 again gives the instrument.

To gauge the potential effects of trade more broadly, measures of import competition are used that also encompass the other initial euro area members[21] and the UK. Results for these three extensions are reported in Table 5, where, for convenience, column 1 reproduces the result from the benchmark specification (Table 1, column 4). There is little movement in the point estimates across the various specifications and none is distinguishable from zero. First-stage results, reported in the lower half of Table 5, remain strong, with F-statistics well above conventional cut-off points. Overall, these results suggest that the negative effects of intensified trade with China for regional French manufacturing employment highlighted previously (Malgouyres, 2017), do not extend to trade more generally.

6. CONCLUSIONS

Germany's trading heft is considerable. It alone accounts for some 25% and 35% of all intra- and extra-euro area trade, respectively. France, the euro area's second largest economy, on the other hand, accounts for only about 12% of both. While the role of German surpluses in the euro area crisis have been well researched, its effects on employment in other countries remains under-researched.

This paper therefore analyses the effect of German import competition on regional French manufacturing employment. Building on previous studies, and in particular on Autor et al. (2013), it uses an exposure research design leveraging differences in regional industry specialisation between French *départements* combined with an IV strategy to capture the effect of German import competition on local French manufacturing employment. A strong negative relationship suggested by a simple bivariate regression is not maintained once other factors are controlled for. Extending the baseline specification to also take French exports to Germany, competition on third markets, and import competition from other industrialised nations into account, does not change this result.

A limitation of this study lies in the granularity of the data it uses both on the industry and the geographical level. More detailed variation along both dimensions might allow researchers to detect patterns that the current level of aggregation forbids. In particular, it would enable a closer examination of the heterogeneous effects of import competition across different manufacturing industries suggested by Figure 4. This would be a useful complement not only to the literature analysing the evolution of European supply chains (e.g., Stöllinger et al., 2018), but also to studies focusing on the firm-level effects of import competition (e.g., Aghion et al., 2021, for an article related to France).

Notwithstanding these caveats, the results of the analysis are useful in so far as they suggest that the observed differential decline in manufacturing employment between French *départements* was not driven by German import competition. Though not impossible, this result, by extension, also indicates that trade with Germany is not one of the causes underlying the overall decline in French manufacturing employment over the past decades.[22] Furthermore, the lack of a positive association also suggests that intensified trade between France and Germany could not halt the overall decline in French manufacturing employment.

Subsequent studies might be interested in further investigating the causes behind the differential changes in regional manufacturing employment in France. As documented by Malgouyres (2017), import competition from China negatively affected regional manufacturing employment in France. A useful extension of this work could be to analyse the extent to which the integration of Eastern European countries impacted on French regional employment structures, given the closer geographical proximity and the deep economic integration between France and these countries. Indeed, for Germany, Dauth et al. (2014) show that the regional employment effects stemming from closer integration with Eastern Europe far outweigh the employment effects from intensified trade with China. Future research might find this an interesting avenue to pursue.

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DISCLOSURE STATEMENT

No potential conflict of interest was reported by the author.

NOTES

1. Le Moigne and Ragot (2015) touch on this point and argue that German wage moderation since the 1990s has been a main driver behind the diverging export performance between France and Germany and, by extension, has increased French unemployment.
2. Goldsmith-Pinkham et al. (2020, appx A) discuss Autor et al. (2013) under the assumption of share exogeneity and show that some of the testable assumptions appear not to be met. Autor et al. (2021, appx A.4) discuss why they see their approach to be more in line with Borusyak et al. (2022) and provide evidence in line with the assumption of shift exogeneity. See also Borusyak et al. (2022, sect. 6.2).
3. For individual worker level effects of import competition, see, for example, De Lyon and Pessoa (2021) and Dauth et al. (2021).
4. The empirical set-up in these studies differs slightly to that in Autor et al. (2013). While the latter operationalise trade shocks using import volumes, Chiquiar (2008), Topalova (2010) and Kovak (2013) do so using tariff changes.
5. In the model developed by Autor et al. (2013), it is only through imbalanced trade that positive export supply shocks lead to a contraction of employment in the traded sector in the destination country.
6. China increased its share in French imports by 4.1 percentage points over this period, and Eastern Europe by 4.5 (here defined as the Eastern European countries that joined the EU in 2004, i.e., the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia).
7. This measure increased by about 11 percentage points between China and the United States between 1991 and 2011 (Autor et al., 2021).
8. This is the result of a bivariate regression of ΔIC_{it} on a region's start-of-period share of manufacturing employment. Simulation results, available from the authors upon request, suggest that this correlation does not impact strongly on estimates of ΔIC_{it}. In Autor et al. (2013), the share of manufacturing employment explains about a quarter of the variation in import competition.
9. Other studies that make use of a Bartik instrument with fixed industry shares include, amongst others, Hummels et al. (2014) and Berman et al. (2017).
10. For issues related to inference in the shocks setting, see Adão et al. (2019).
11. The European Commission also provides regional trade data through its EUREGIO database for the period 2000–10 (Thissen et al., 2018). Given this limited time span, this study uses the national trade data provided through Comext.
12. Figure A2 in Appendix A in the supplemental data online shows the 25% of DEPs that experienced the largest declines in their respective shares of manufacturing employment.
13. Since the model is in first differences, unit fixed effects are eliminated.
14. Squaring the reported t-statistics of the import competition variable gives the corresponding F-statistics. These all lie above 716, which is safely above the critical values suggested by Montiel Olea and Pflueger (2013) and Lee et al. (2022). No Anderson-Rubin weak instrument robust confidence intervals are therefore reported.
15. This is because negative α-weights in combination with varying industry estimates can put non-convex

weights on the overall Bartik estimator. Goldsmith-Pinkham et al. (2020, sect. IV) provide the details.

16. Classification code CL (see Table A2 in Appendix A in the supplemental data online). This category subsumes CPA categories 29 and 30.

17. These results are similar to Card (2009), as discussed by Goldsmith-Pinkham et al. (2020).

18. This robustness check serves to further address the finite sample properties of the 2SLS estimator. While consistent, 2SLS is known to be biased, with the bias driven by the number of instruments and their respective strengths. As such, the bias is smallest in the just-identified case (that considered in the baseline specification). The strength of the first stage, as reported in Table 1, together with the similar point estimates of the different estimators, as reported in Table 4, both suggest that the bias of the estimates should be small. Comparing estimates from overidentified 2SLS and LIML, Angrist and Pischke (2009) note: 'Check overidentified 2SLS estimates with LIML. LIML is less precise than 2SLS, but also less biased. If the results come out similar, be happy' (p. 213). They also provide a comprehensive overview of the bias of 2SLS (Angrist & Pischke, 2009, ch. 4.6.4).

19. The first-stage F-statistic indicates the power of the instrument. Choosing a value of 5 as a cut-off point follows Goldsmith-Pinkham et al. (2020).

20. These are (in order of importance): Italy, the UK, Spain, Belgium, the United States, the Netherlands, Switzerland, China, Japan, Poland, Portugal, Sweden, Turkey, Algeria and Russia.

21. These are: Austria, Belgium, Finland, Ireland, Italy, the Netherlands, Spain and Portugal, all of which adopted the euro in 1999, plus Greece which joined in 2001. Luxembourg is not included for data reasons.

22. The study's exposure research design is based on the idea that regions more exposed to German trade react stronger to increases in trade with Germany than less exposed regions. If increased trade with Germany affected all regions equally, independent of their exposure, the analysis would fail to capture this.

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